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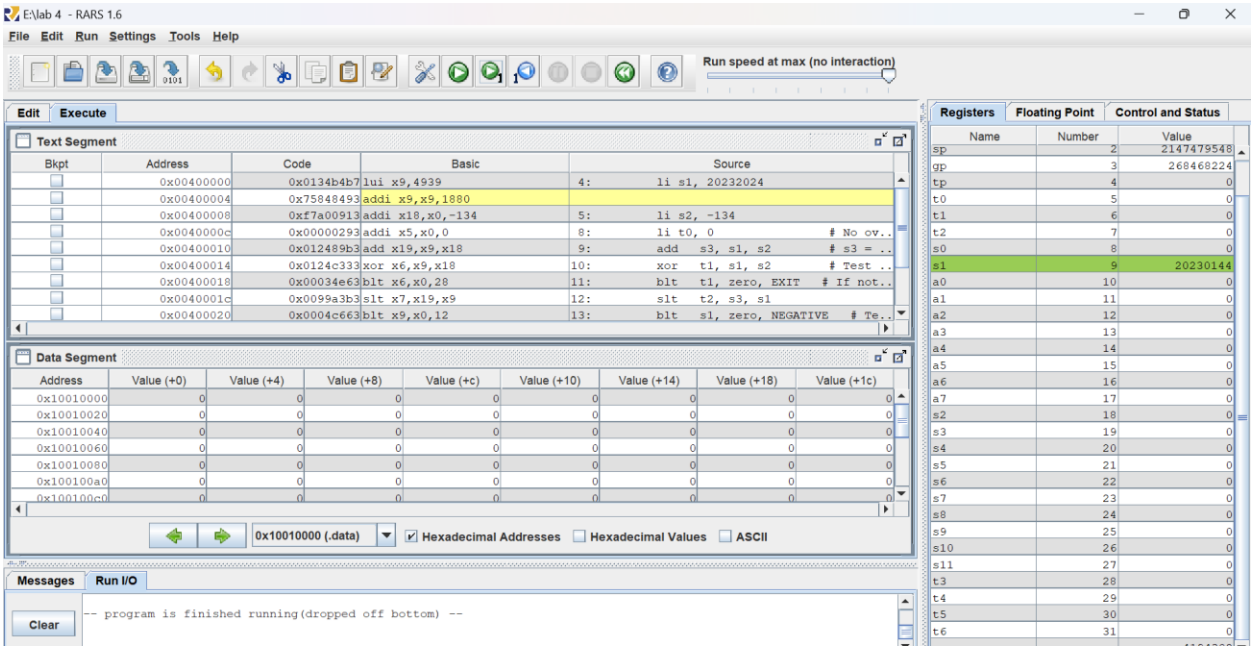
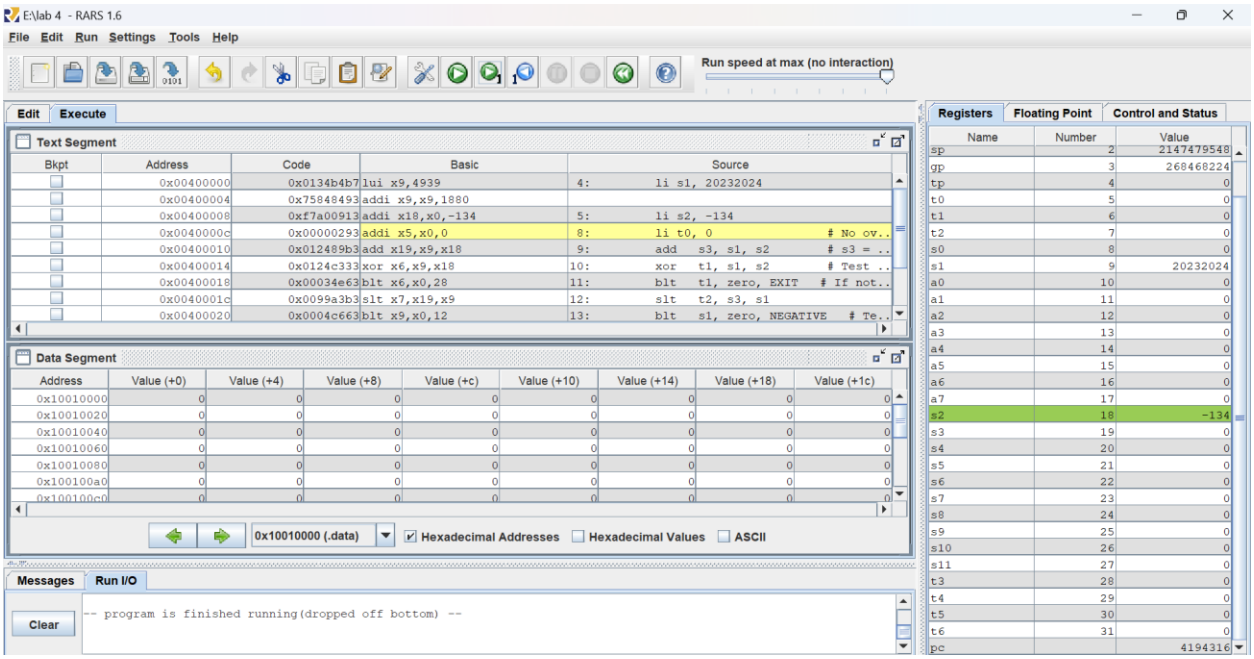
Asignment 1: Create a new project to implement the Home Assigment 1. Compile and upload to simulator. Initialize two operands (register s1 and s2), run this program step by step, observe memory and registers value.

Case 1: s1 and s2 have different sign

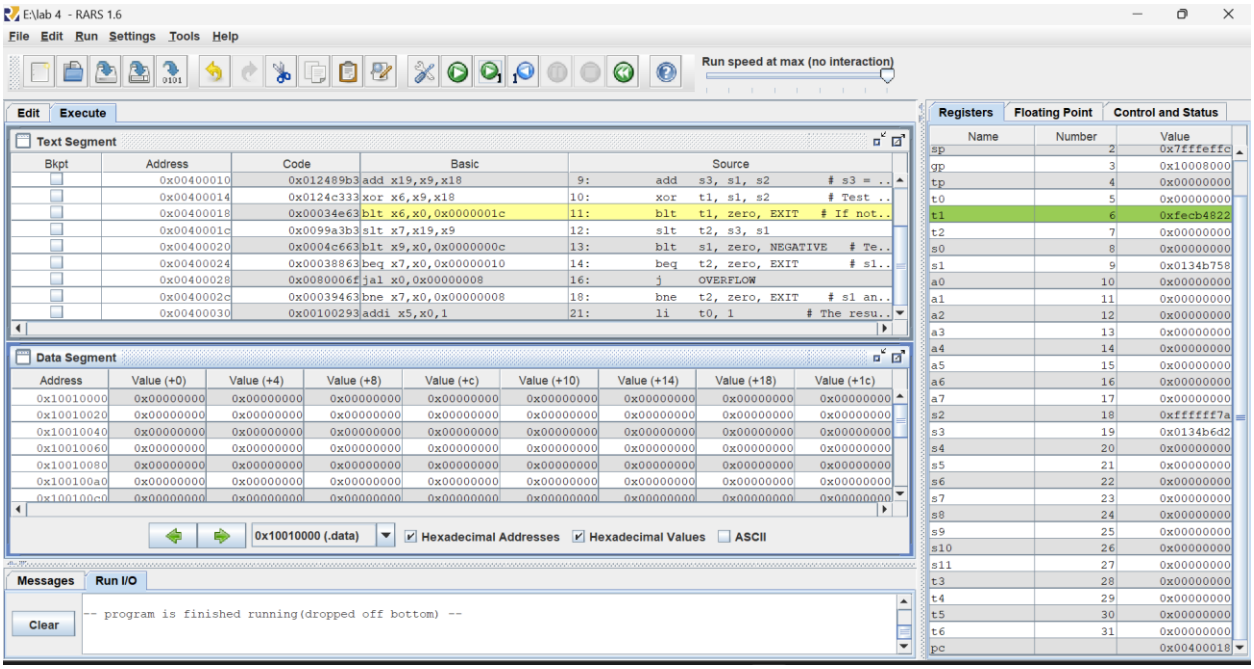
We initialize s1=20232024, s2= -134

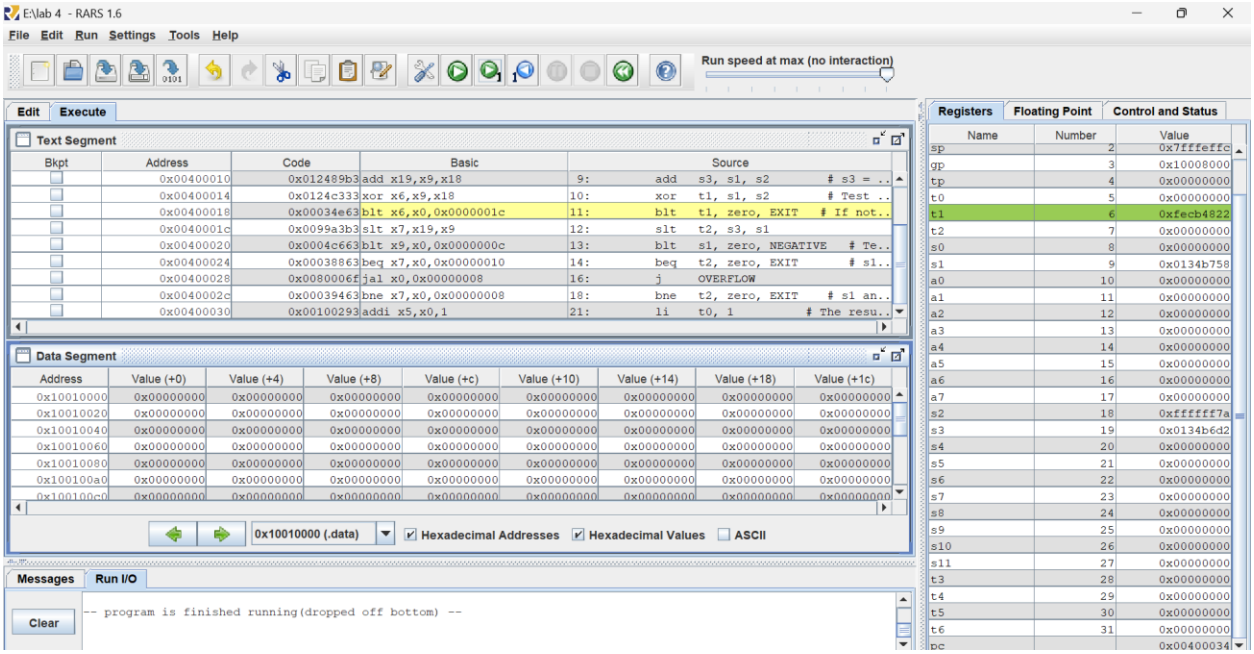




Because s1 and s2 have different sign, register t1 less than 0 and program jumps to EXIT label

The register pc jumps from address 0x00400018 to address 0x00400034 and then the program ends.





Case 2: s1 and s2 have the same signe but s1+s2 doesn't overflow.

We initialize s1=20231044 and s2=23

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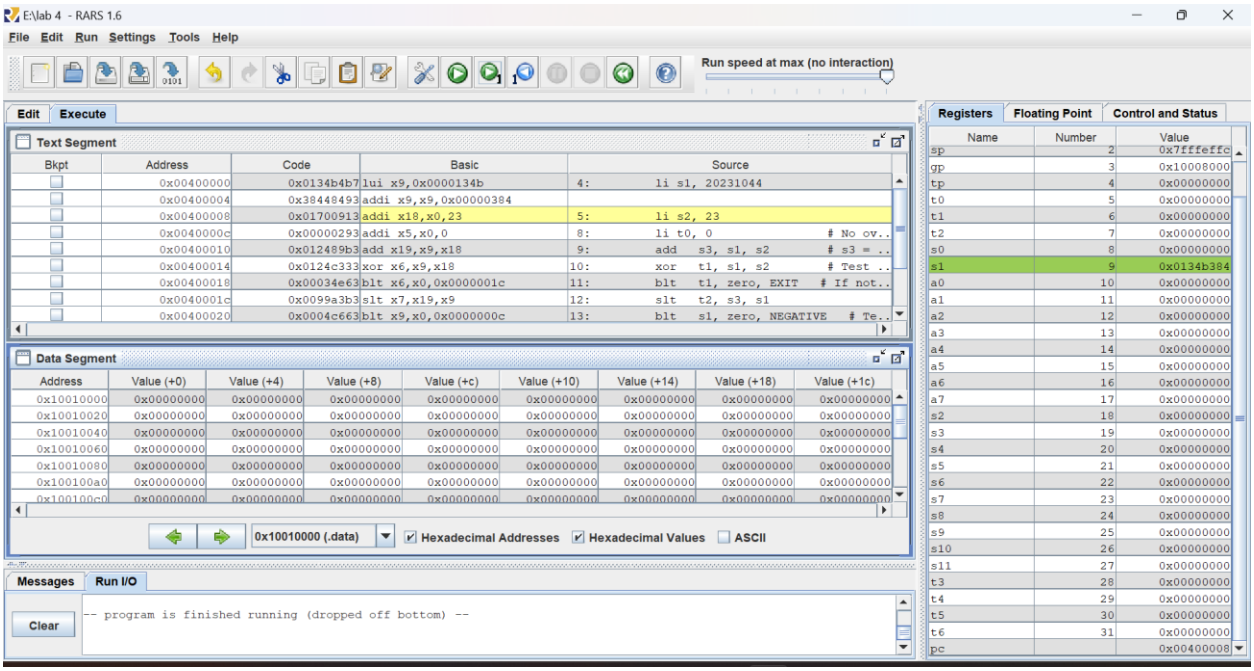

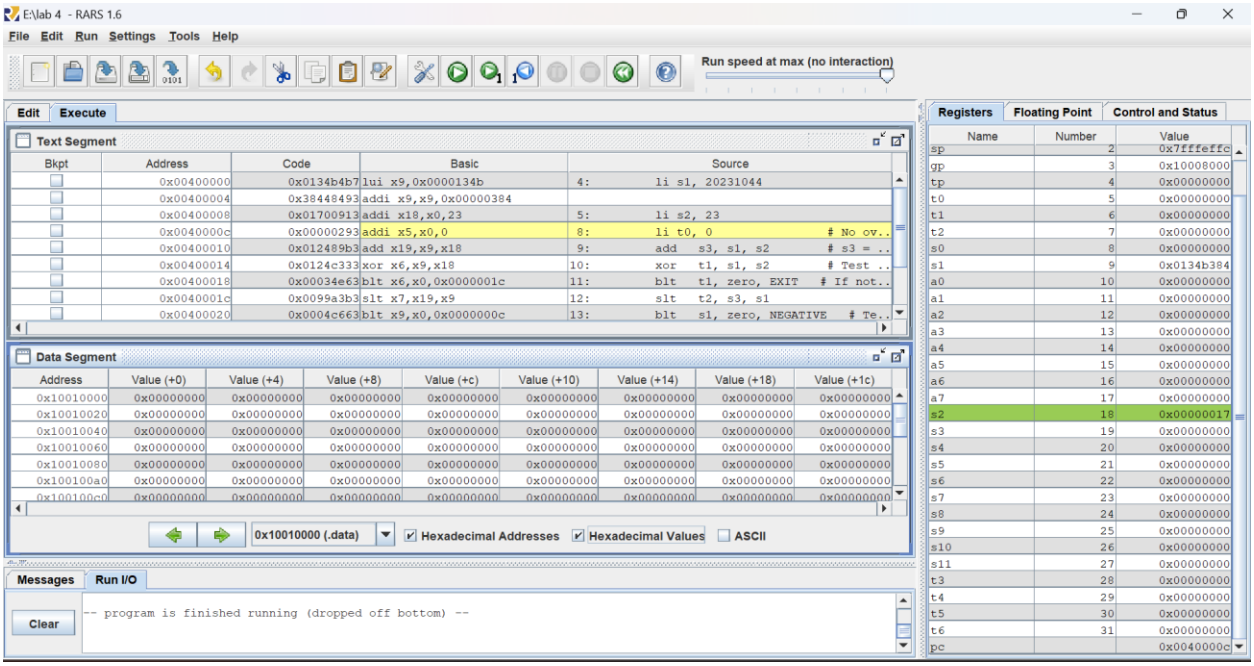

Because s1 and s2 have the same sign, the instruction “slt t2, s3, s1” is executed.

Because s3=s1+s2 is greater than s1, the program jumps to EXIT label and the register pc jumps from address 0x00400024 to 0x00400034

Then, the program ends.

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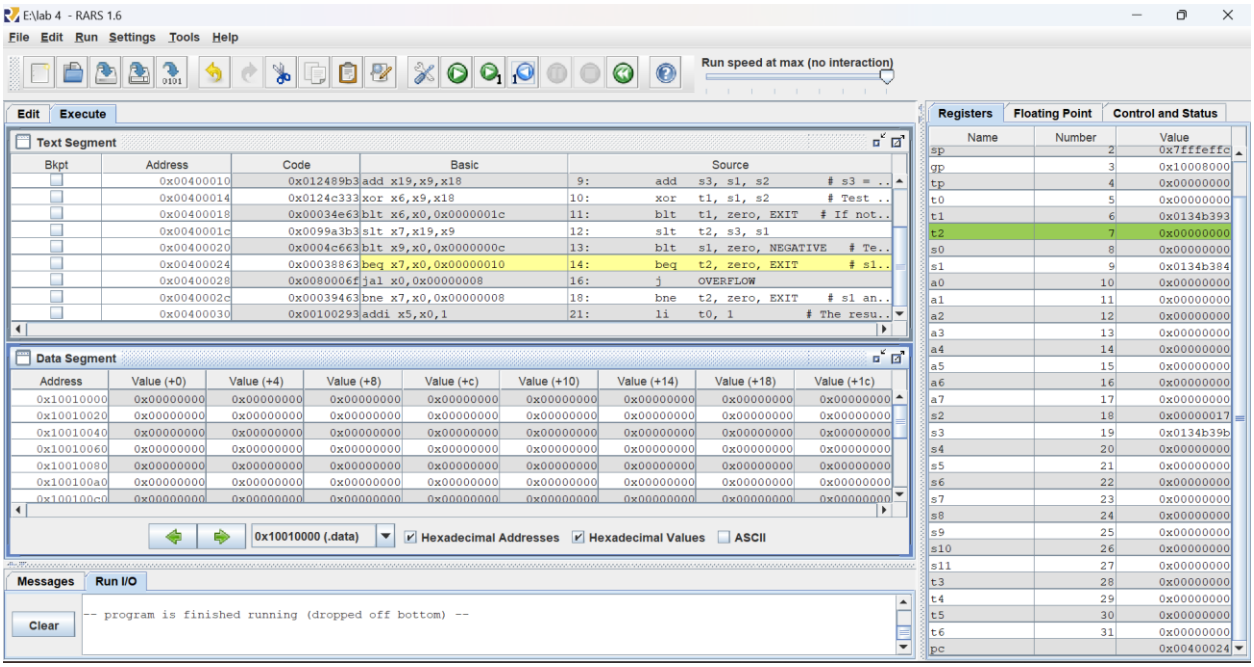

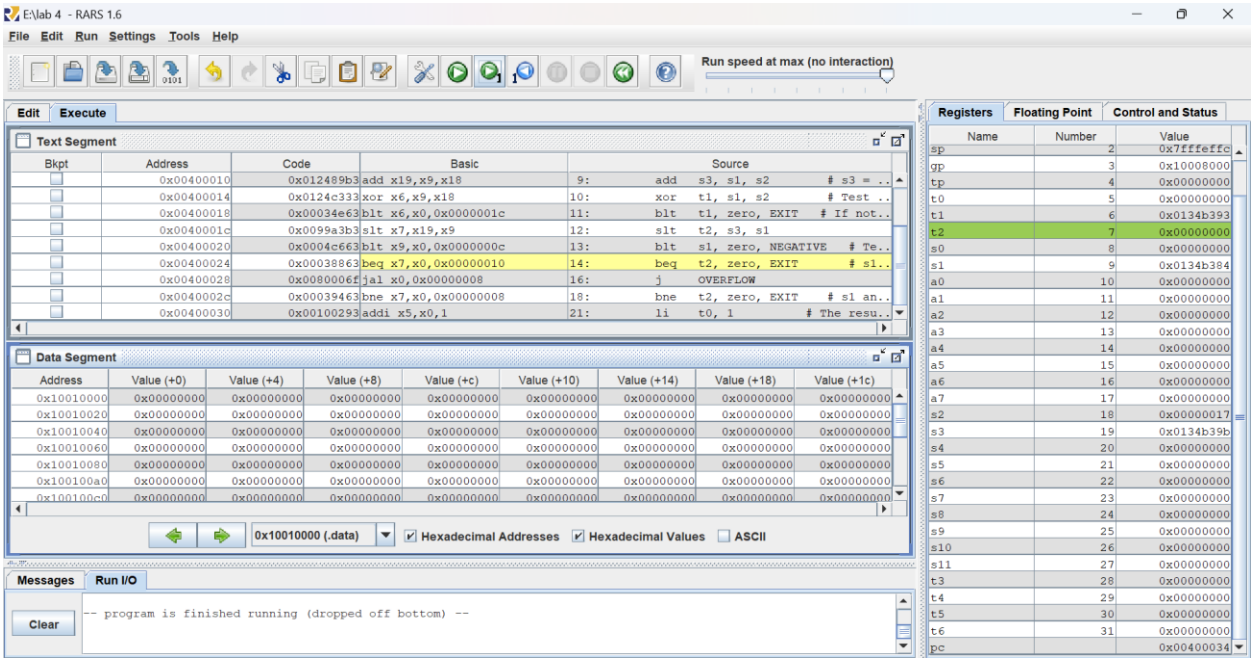

Case 3: s1 and s2 have the same sign and s3=s1+s2 overflows.

We initialize s1=1000000000, s2=2000000000

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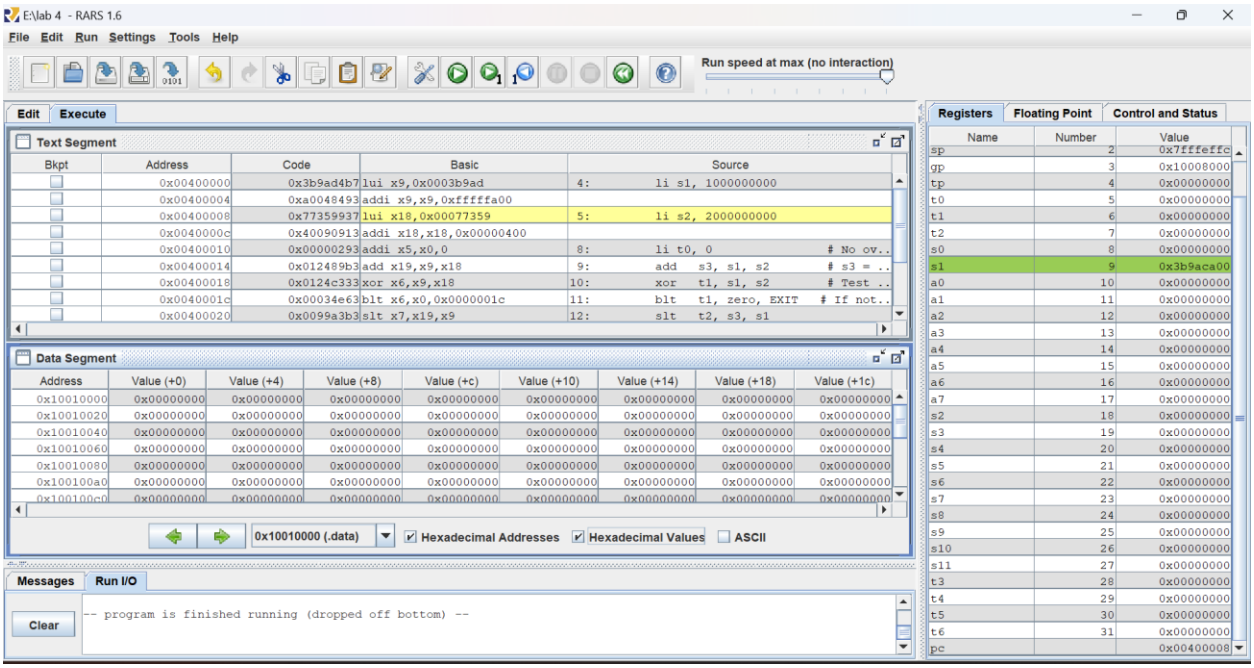

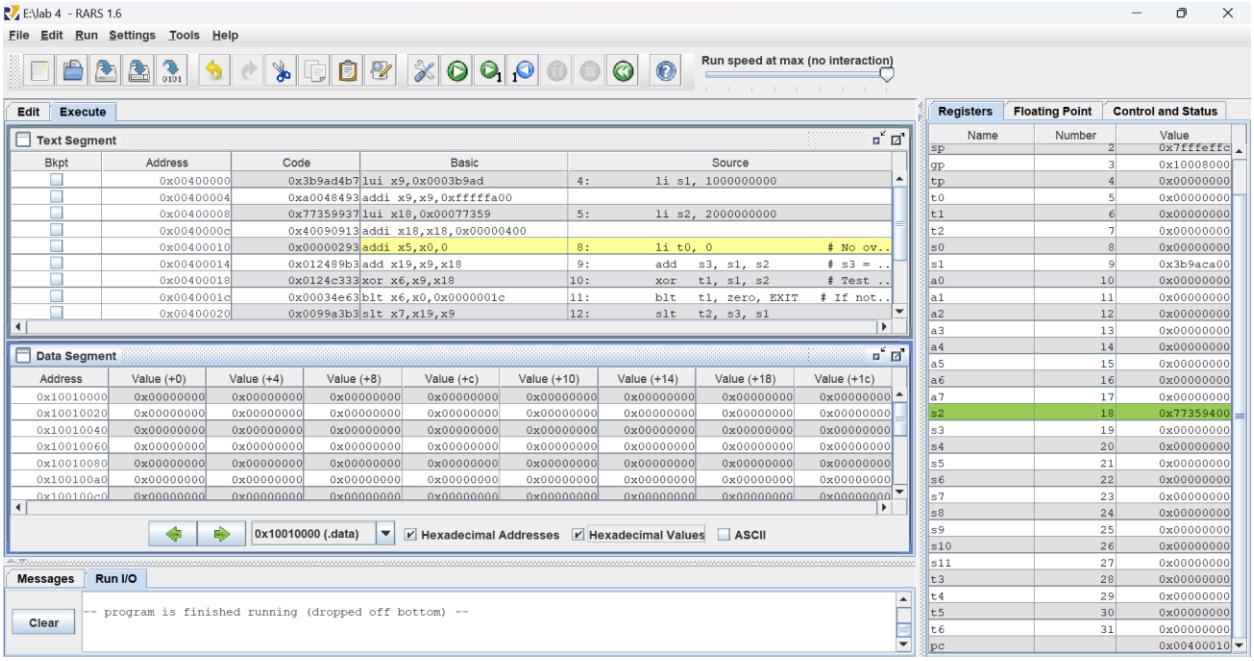

Because s1 and s2 have the same sign, the register t1>0 and the program don’t jump to EXIT label.

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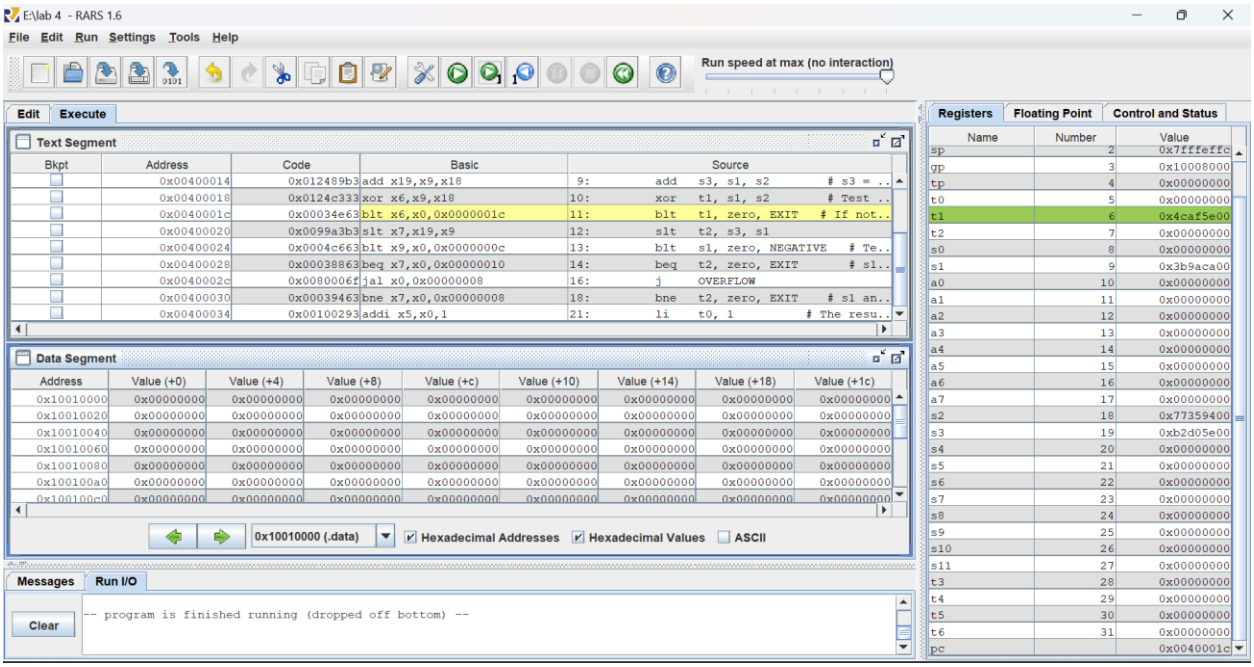
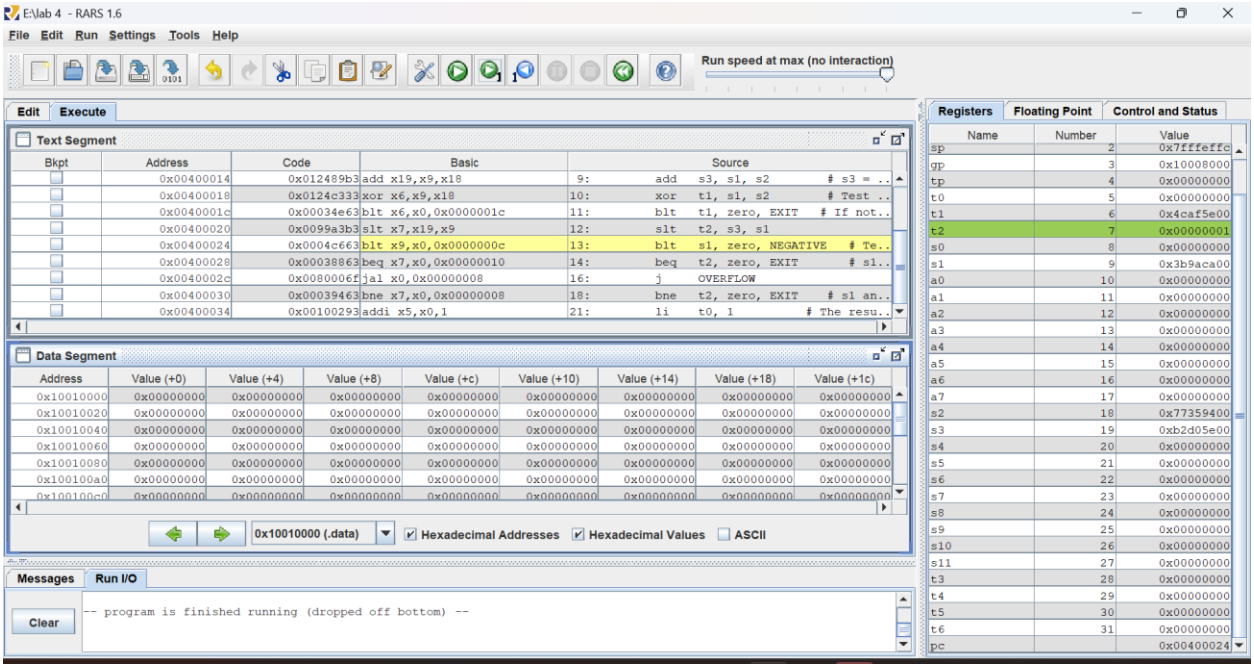


We compare the register s3=s1+s2 with register s1.



Because s3 < s1 and s1, s2 are positive, the register t0 gets value 1. It means that overflow occurred in the program.

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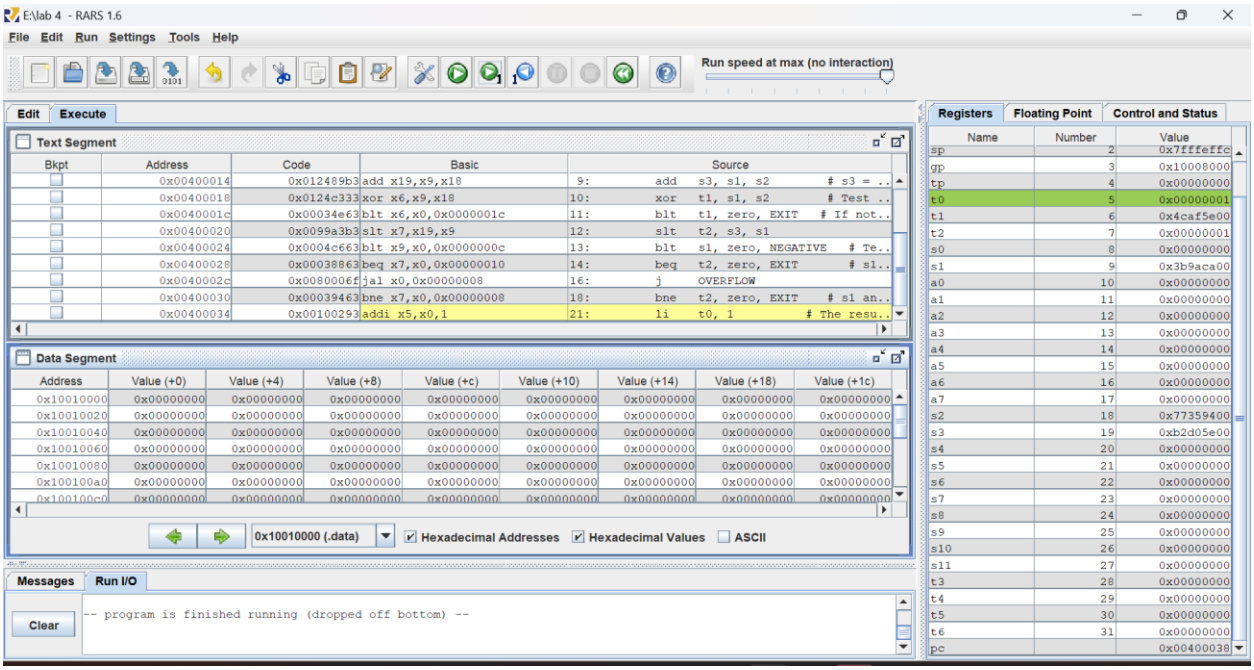


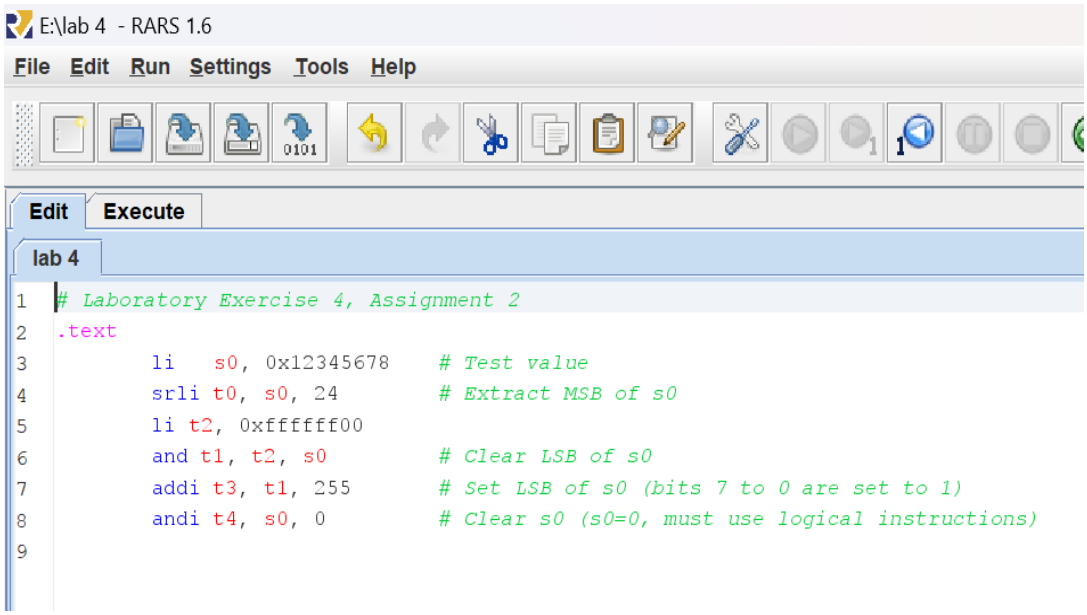
The program ends.

Assignment 2:

Write a program to do the following tasks:

- **Extract MSB of s0**
- **Clear LSB of s0**
- **Set LSB of s0 (bits 7 to 0 are set to 1)**
- **Clear s0 (s0=0, must use logical instructions)**

We initialize s0=0x12345678



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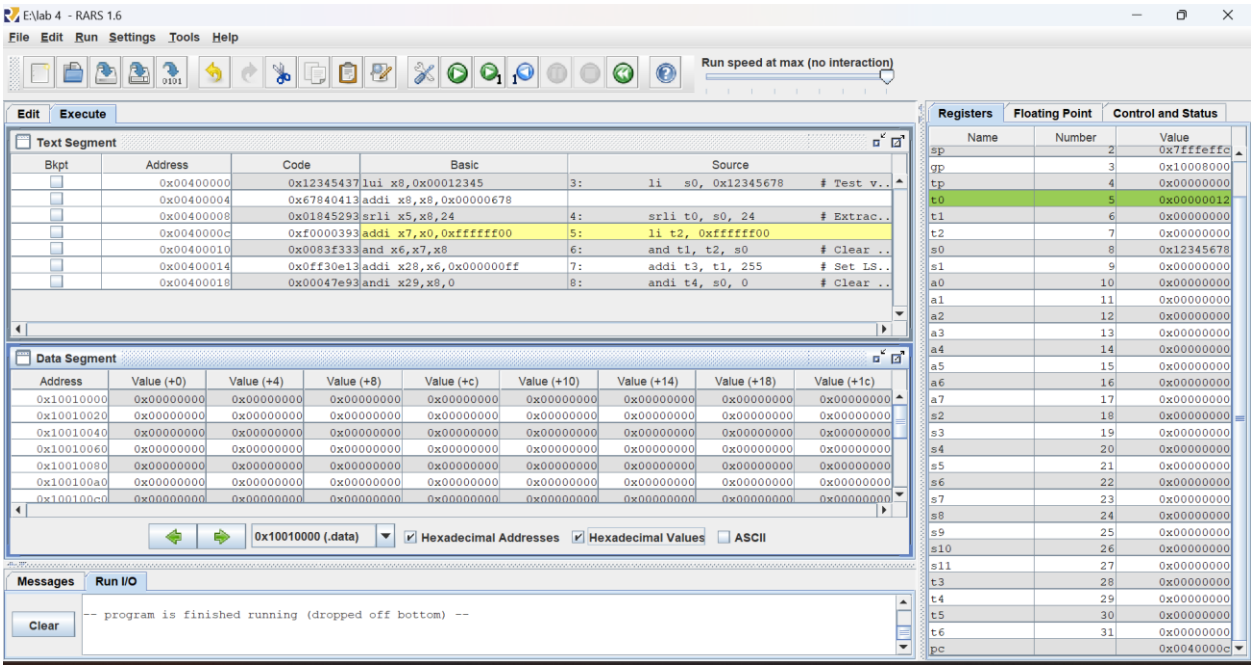
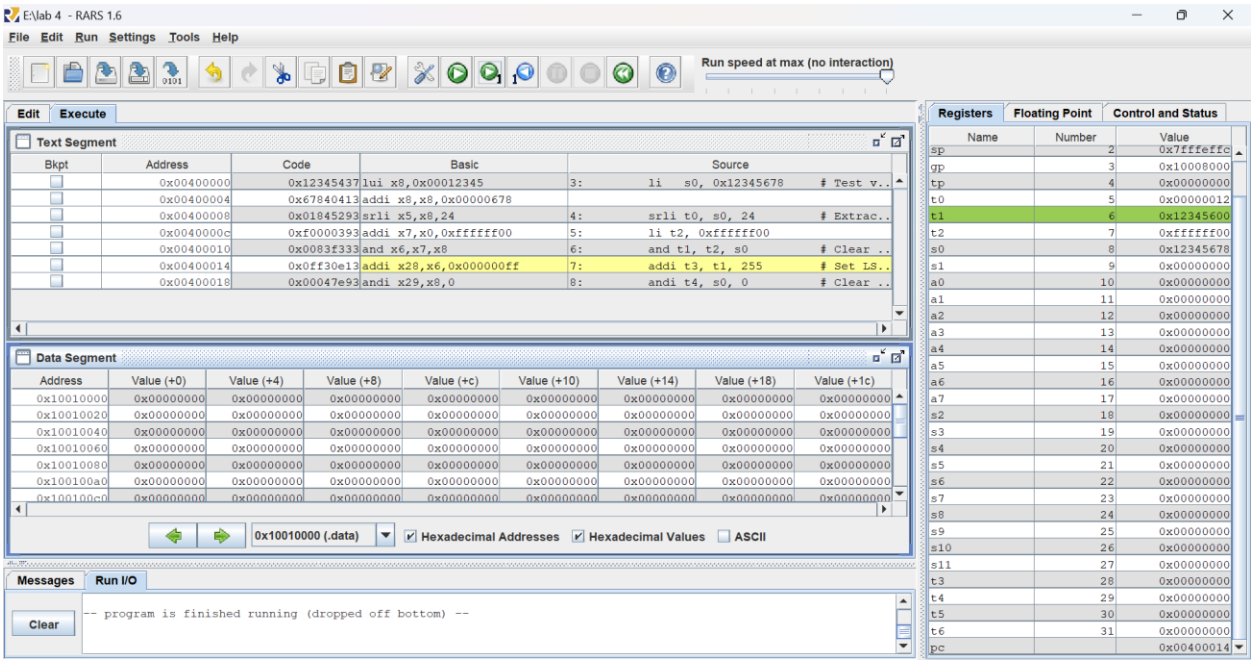
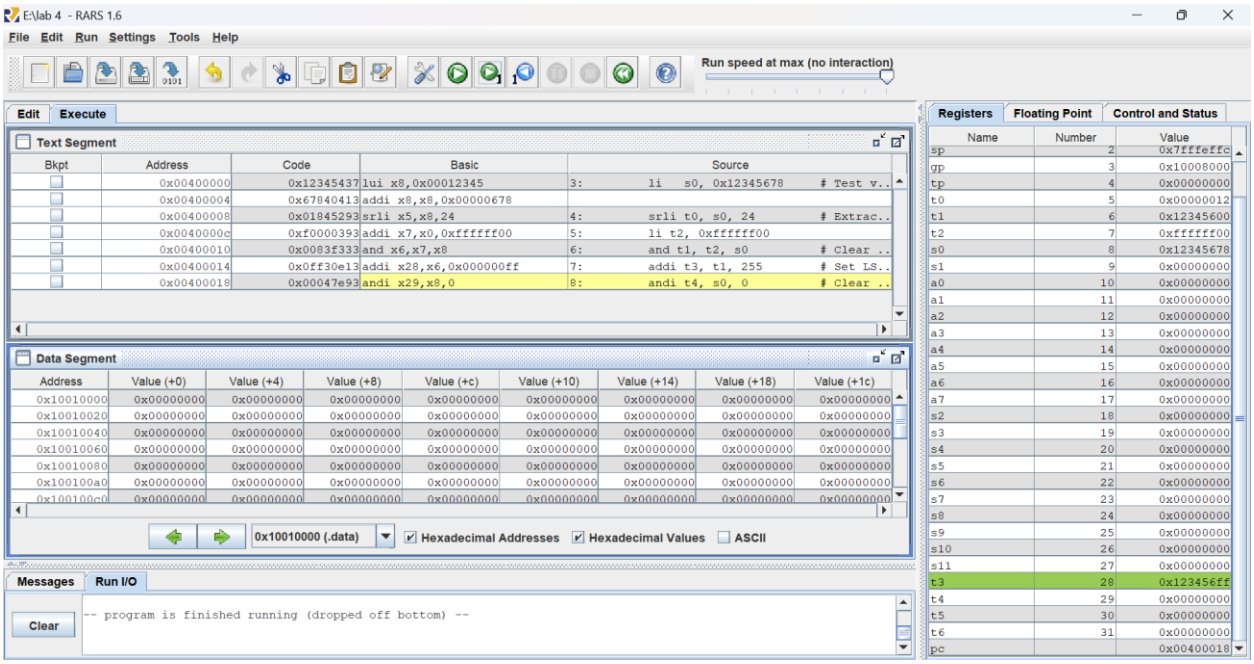
- Extract MSB of s0: t0=0x12



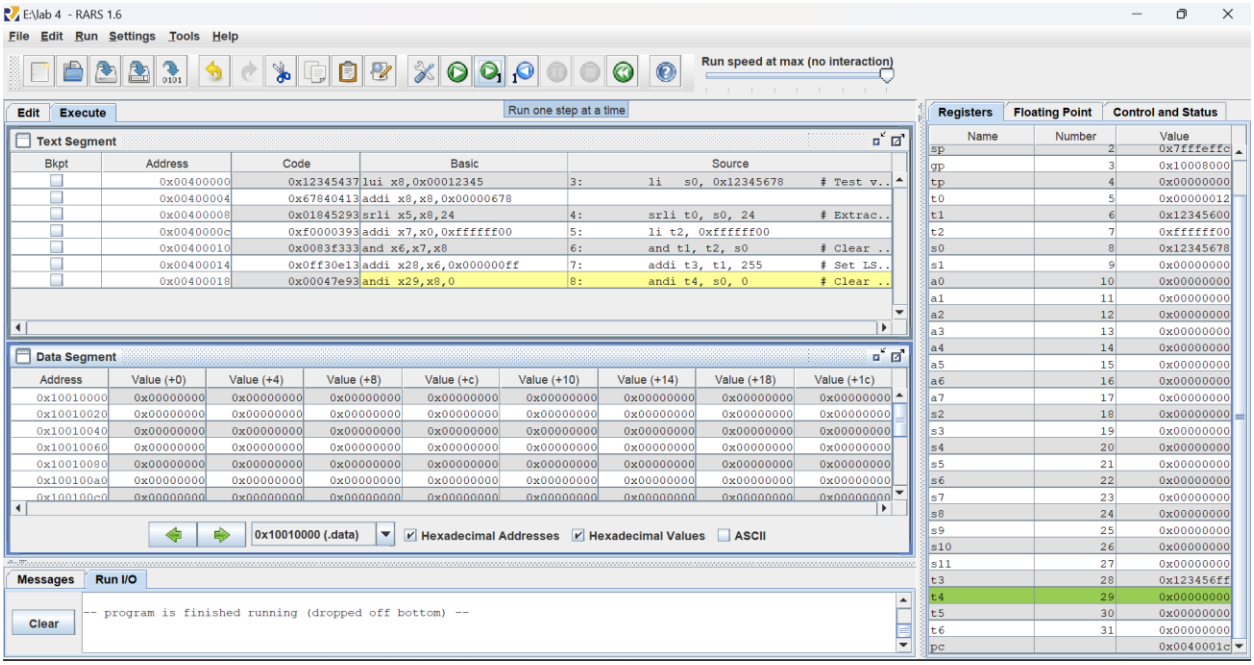
- Clear LSB of s0: t1=0x12345600



- Set LSB of s0 (bits 7 to 0 are set to 1) : t3=0x123456ff



- Clear s0 (s0=0, must use logical instructions): t4=0x00000000



Assignment 3: Pseudo instructions in RISC-V are not-directly-run-on-RISC-V-processor instructions which need to be converted to real-instructions of RISC-V. Re-write the following pseudo instructions using real-instructions understood by RISC-V processors:

a.

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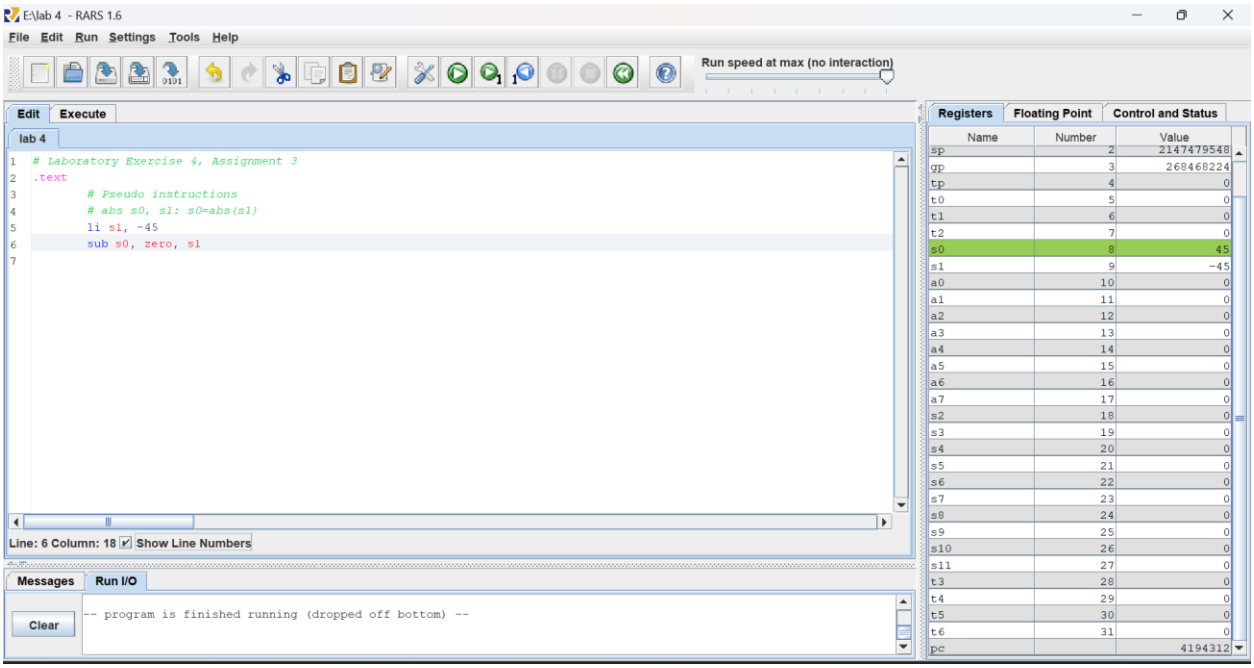

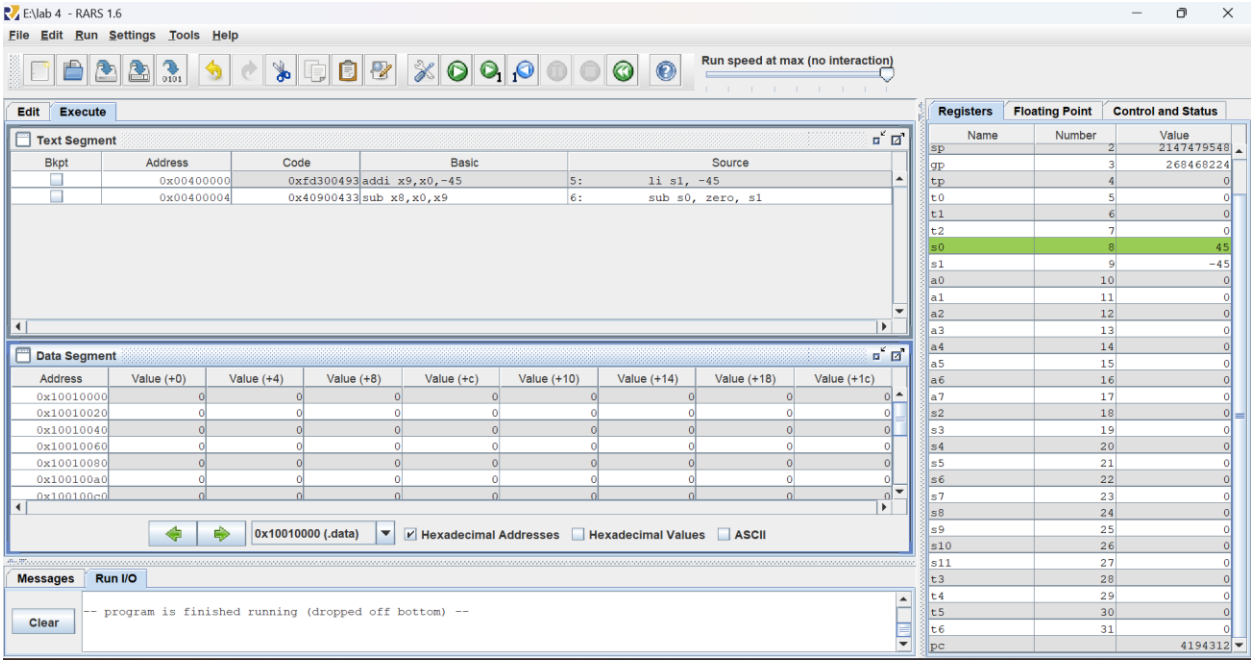

b.

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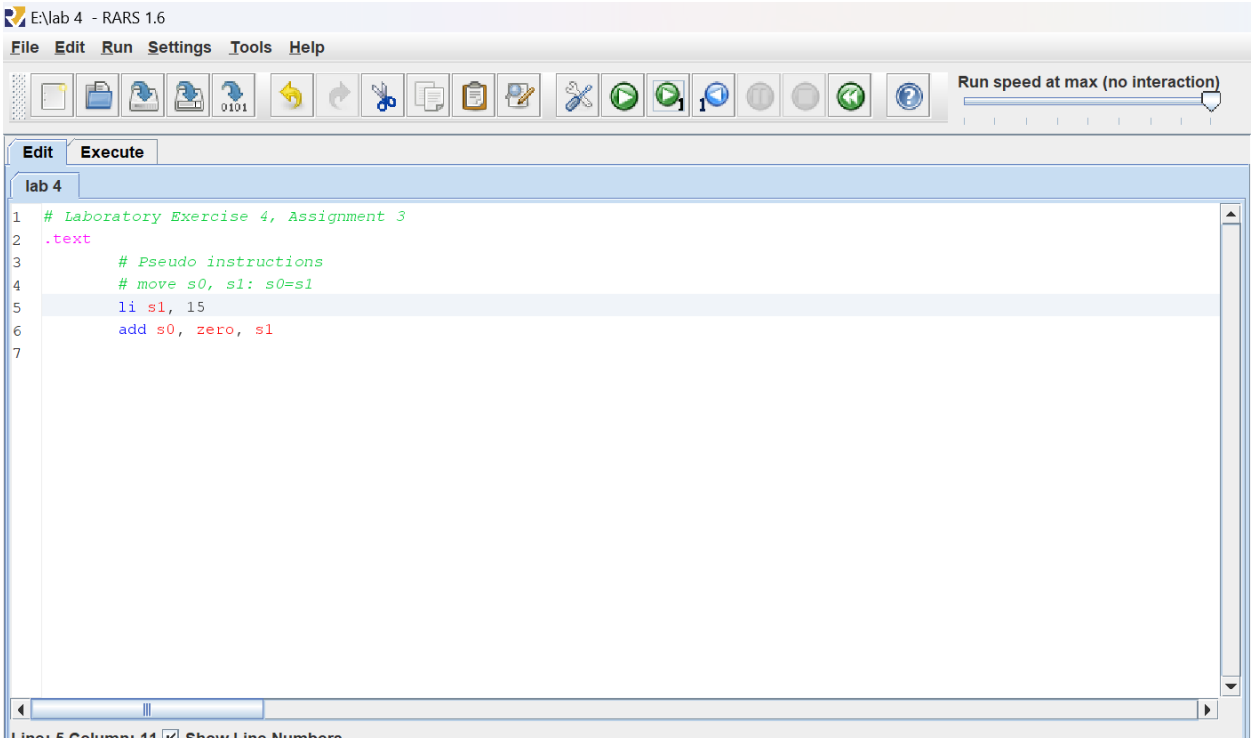

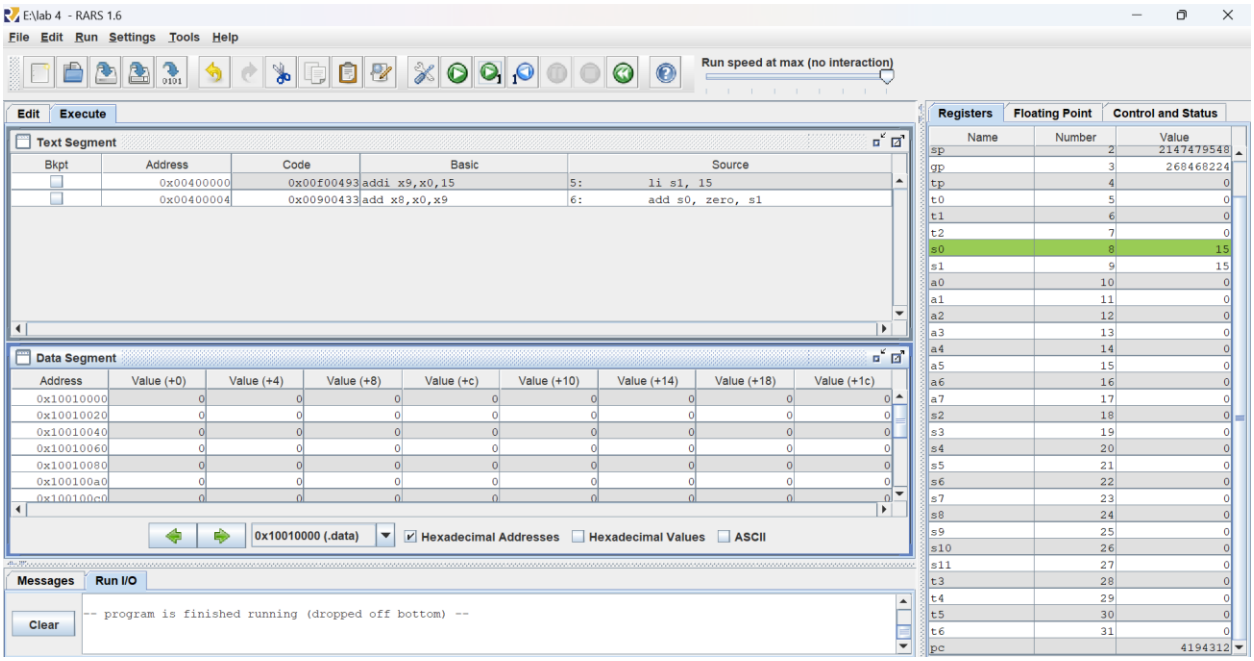

C.

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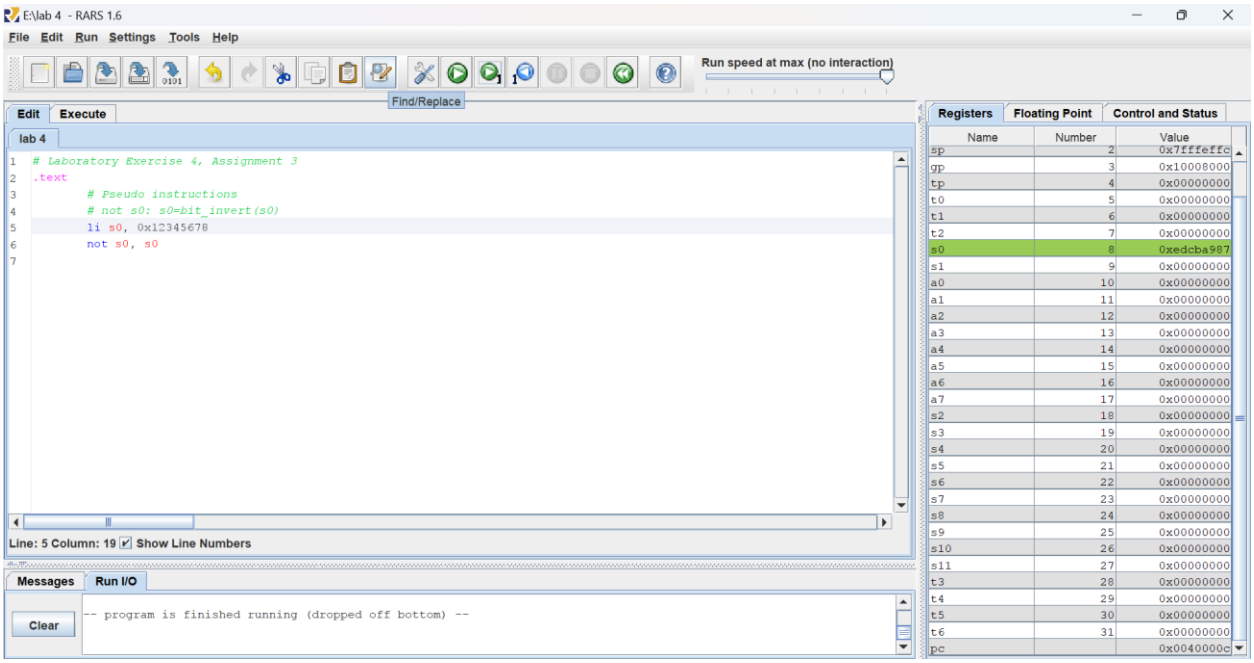

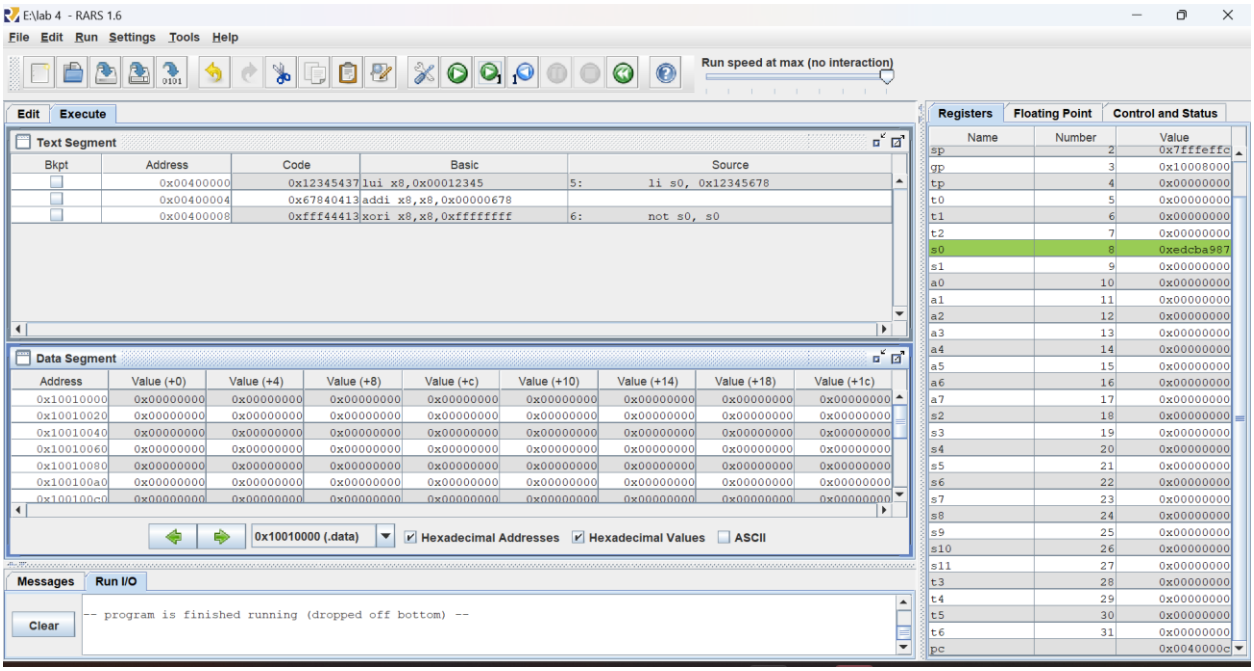

d.

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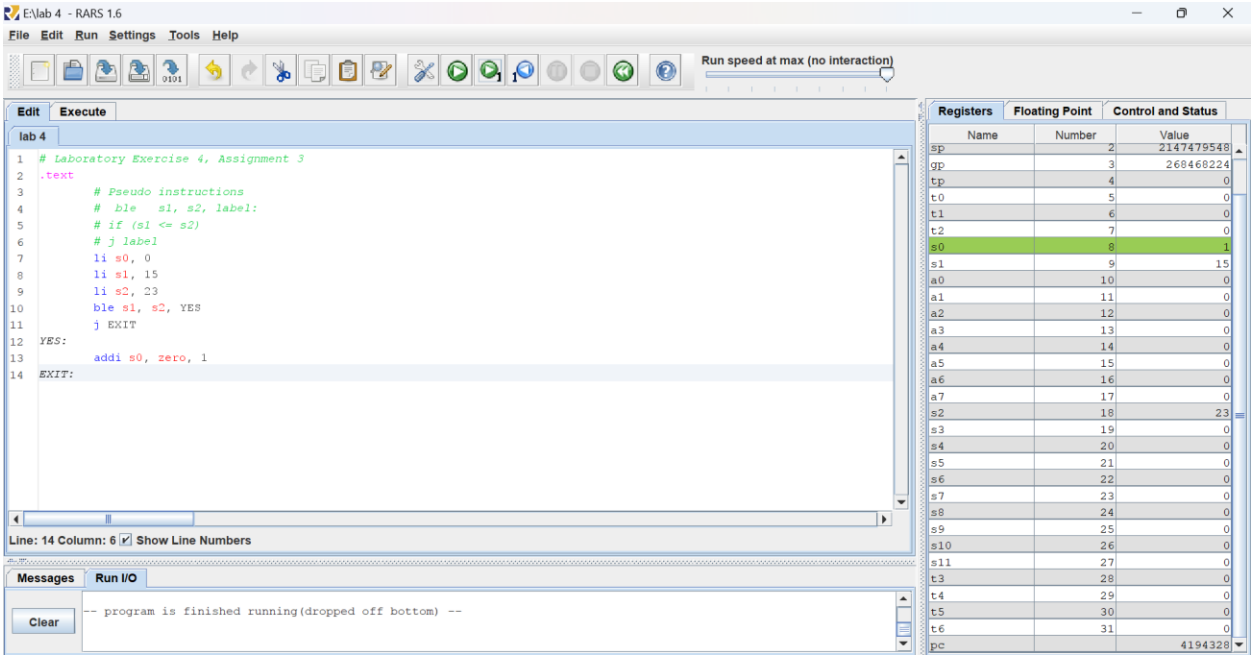
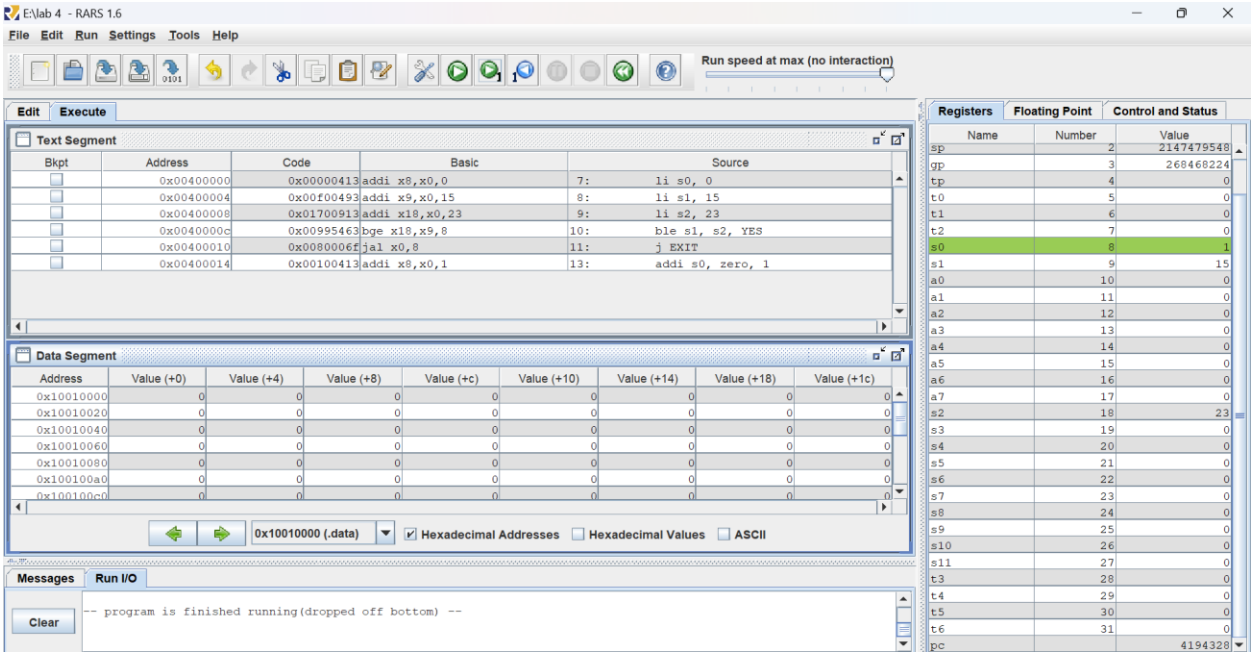


S0=1, it means s1<=s2:



Assignment 4: To dectect overflow in additional operation, we also use other rule than the one in Assignment 1. This rule is: when add two operands that have the same sign, overflow will occur if the sum doesn't have the same sign with either operands. You need to use this rule to write another overflow detection program.

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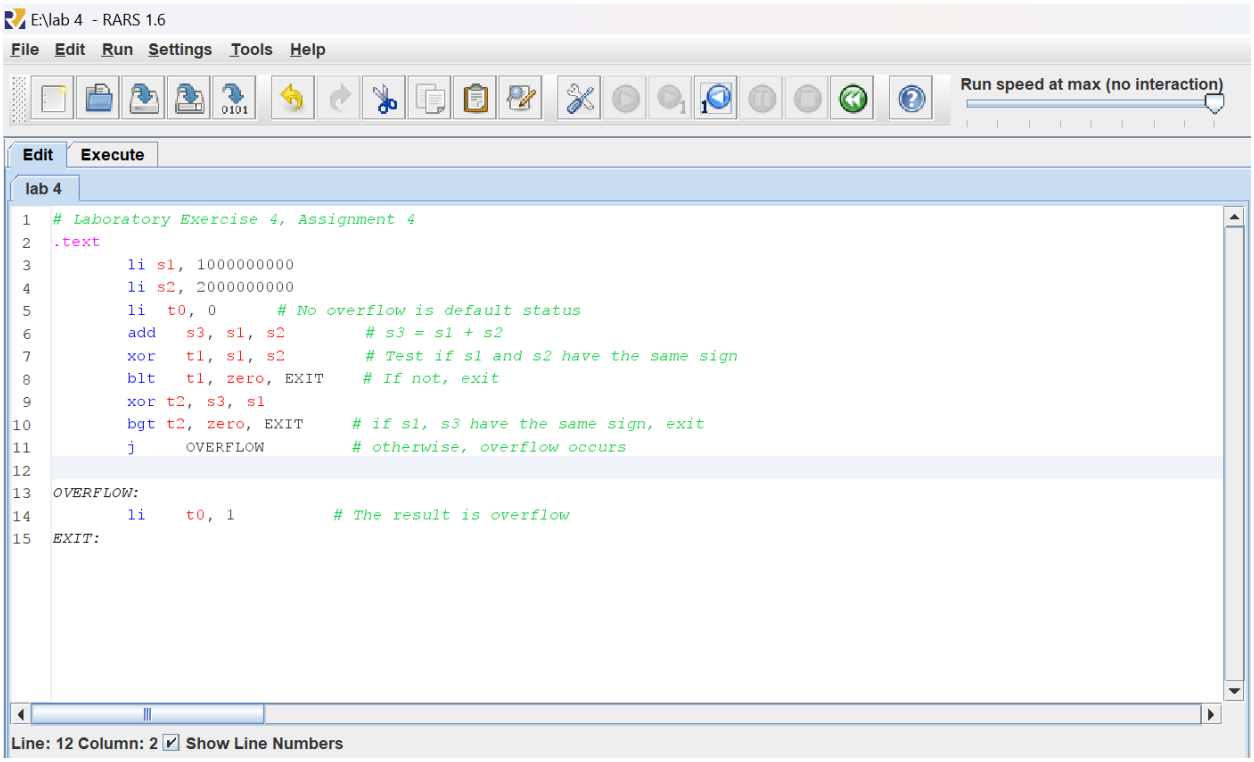
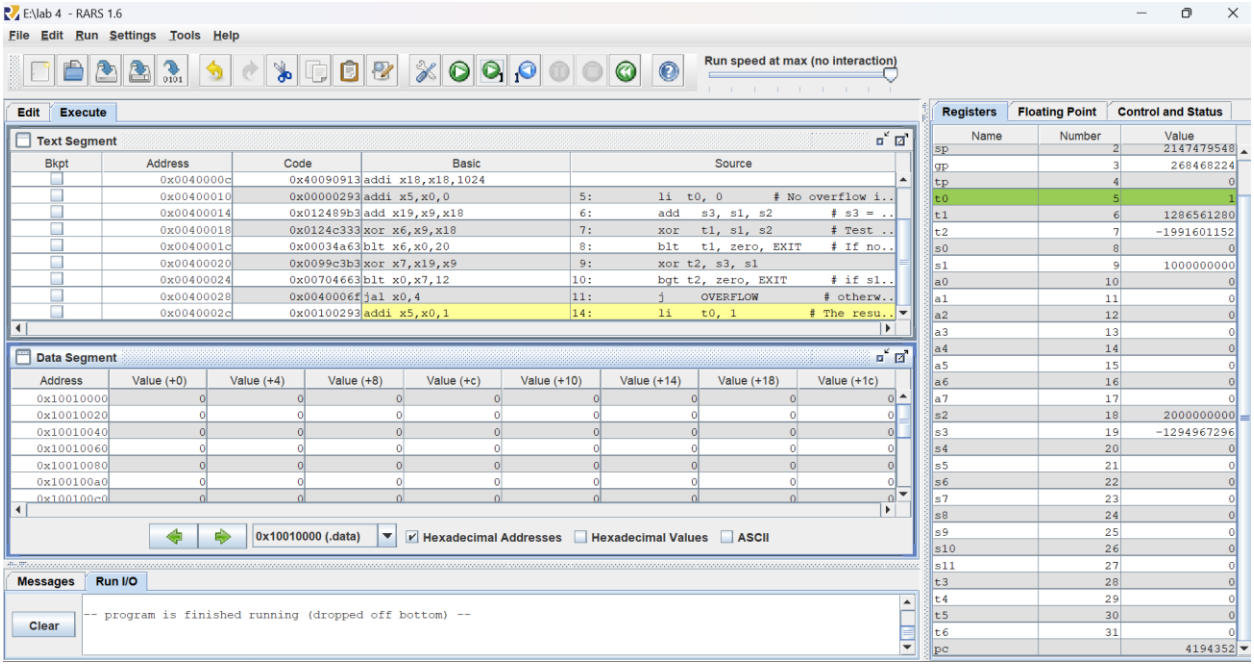


We see that t0=1, so overflow occurred in this program



Assignment 5: Write a program that implement multiply by a small power of 2. (2, 4, 8, 16, etc for example).

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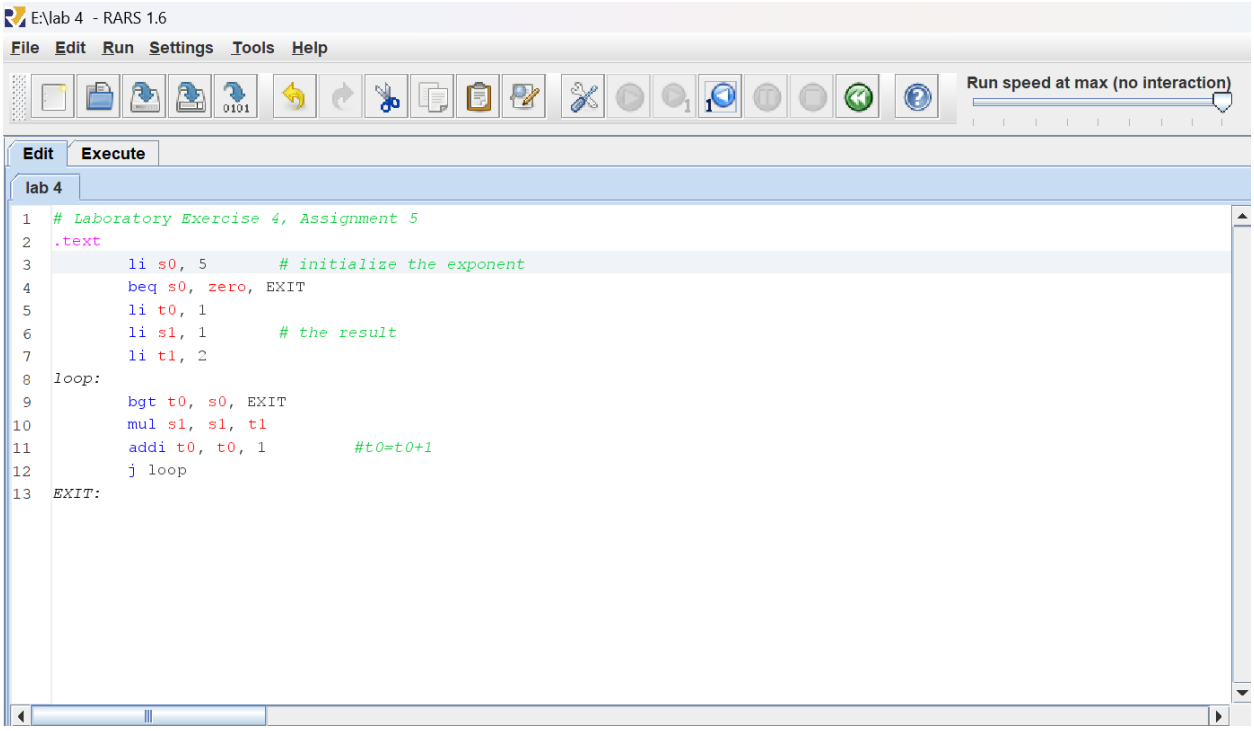

We have s0 is the exponent and its value is up to us

We store the value of $\mathbf{2^{s0}}$ in the register s1

In the example below, s0=5. So, we get value $2^5=32$ in the register s1. In other words, s1=32.